National Institute of Environmental Health Sciences

Microcystins in potable surface waters: Toxic effects and removal strategies

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Abstract:

In freshwater, harmful cyanobacterial blooms threaten to increase with global climate change and eutrophication of surface waters. In addition to the burden and necessity of removal of algal material during water treatment processes, bloom-forming cyanobacteria can produce a class of remarkably stable toxins, microcystins, difficult to remove from drinking water sources. A number of animal intoxications over the past 20 years have served as sentinels for widespread risk presented by microcystins. Cyanobacterial blooms have the potential to threaten severely both public health and the regional economy of affected communities, particularly those with limited infrastructure or resources. Our main objectives were to assess whether existing water treatment infrastructure provides sufficient protection against microcystin exposure, identify available options feasible to implement in resource-limited communities in bloom scenarios and to identify strategies for improved solutions. Finally, interventions at the watershed level aimed at bloom prevention and risk reduction for entry into potable water sources were outlined. We evaluated primary studies, reviews and reports for treatment options for microcystins in surface waters, potable water sources and treatment plants. Because of the difficulty of removal of microcystins, prevention is ideal; once in the public water supply, the coarse removal of cyanobacterial cells combined with secondary carbon filtration of dissolved toxins currently provides the greatest potential for protection of public health. Options for point of use filtration must be optimized to provide affordable and adequate protection for affected communities.

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Food/Water Quality

Food/Water Quality: Biotoxin/Algal Bloom

Geographic Feature:

resource focuses on specific type of geography

Freshwater, Ocean/Coastal

Geographic Location:

resource focuses on specific location

Global or Unspecified

Health Impact:

specification of health effect or disease related to climate change exposure

Health Outcome Unspecified

Intervention:

strategy to prepare for or reduce the impact of climate change on health

A focus of content

Mitigation/Adaptation:

mitigation or adaptation strategy is a focus of resource

Adaptation

Resource Type:

format or standard characteristic of resource

Review

Timescale:

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment:

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content